

# इंटरनेट

# मानक

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IS 12267-1 (1987): Guidelines for stability for inland and harbour vessels, Part 1 Decked vessels [TED 18: Inland, Harbour Crafts and Fishing Vessels]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”



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*Indian Standard*GUIDELINES FOR STABILITY FOR  
INLAND AND HARBOUR VESSELS

## PART 1 DECKED VESSELS

**1. Scope** — This standard lays down the guidelines pertaining to stability of decked inland and harbour vessels, which fall under the purview of *Inland Vessels Act 1977* and *Coasting Vessels Act 1838* ( as amended in 1952 ).

**2. Groups** — The vessels shall be grouped into the following for the purpose of this standard:

Group	Description
A	a) Passenger ferries b) Vehicle and combined load ferries c) Tank vessels for liquid cargo d) Deck loading and container carrying vessels
B	a) Floating cranes b) Grab dredgers with and without hopper
C	a) Hopper type vessels ( open hoppers and without door ) b) Dredgers with hoppers
D	Towing tugs and fire floats
E	Well decked vessels ( mainly for passenger )
F	All launches and similar crafts
G	a) Dry cargo vessels b) Other types of vessels not falling under groups A to F above.

**3. Terms and Definitions** — For the purpose of this standard, the following terms and definitions shall apply.

**3.1 Capacity Plan and Tables** — Applicable for cargo or high deadweight (  $DWT/\Delta = 0.4$  or above ) vessels and tank vessels.

**3.2 Consumable Stores** — Fuel, fresh water and food.

**3.3 Deadweight ( DWT )** — Measure of the tonnage of a ship representing the weight of cargo, bunker fuel, water ( fresh and boiler feed ), passengers and crew which a ship can carry when loaded to her load line.

**3.4 Displacement (  $\Delta$  )** — Weight in tonnes of water displaced by the ship. Light displacement is the weight exclusive of ballast and the items mentioned under loaded displacement. It includes boilers, if any, filled with water. Loaded displacement includes stores, fresh water, feed water, fuel, cargo, passengers and crew so that she is loaded to her summer load line.

**3.4.1 Draught (  $T$  )** — Mean draught at light or loaded condition as applicable. This will be draught at midship from upper edge of flat keel plate or in case of barkeel from intersection of barkeel and garboard stake to waterline.

Adopted 4 December 1987

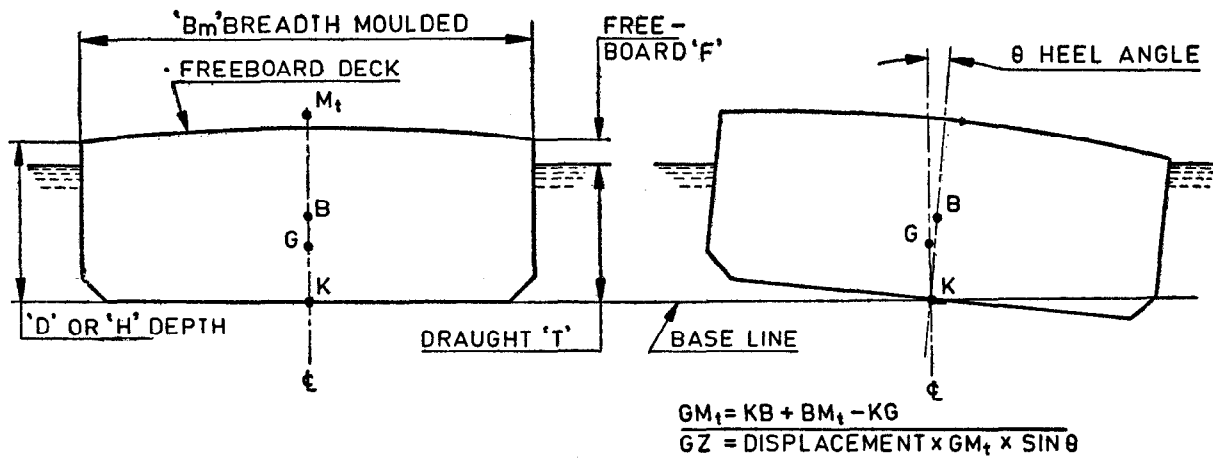
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**3.4.2 Freeboard (  $F$  )** — Vertical height at midship from waterline to lower edge of maindeck plating at side. In other words, it is moulded depth less moulded draught ( Fig. 1 ).

**3.5 Heel Angle (  $\theta$  )** — Angle of inclining or listing in transverse direction due to wind pressure or shifting cargo or ballast ( Fig. 1 ).



Mid Ship Section of Inland Vessel in Upright Condition

Vessel with Small Angle of Heel

FIG. 1 NOMENCLATURE OF DECKED VESSEL ( TRANVERSE )

**3.6 Hydrostatic Curves and Tables** — Data for different draughts consisting of  $\Delta$ ,  $\Delta$  extreme,  $\overline{KB}$ ,  $BM_t$ ,  $KM_t$ ,  $MCT$ ,  $TPC_m$ ,  $LCB$ ,  $LCF$  and co-efficients.

**3.6.1  $\overline{KB}$**  — is height of centre of buoyancy of underwater volume from keel at centreline of vessel ( Fig. 1 ).

**3.6.2  $\overline{KM}$**  — is height of metacentre ( transverse ) from top of keel at centreline of vessel ( Fig. 1 ).

**3.6.3  $\overline{KM}_t$**  — is same as above but for longitudinal metacentre.

**3.6.4  $BM$**  — is  $\overline{KM}$  less  $\overline{KB}$ ; similarly  $GM$  is  $KM$  less  $KG$  ( Fig. 1 ).

**3.6.5  $LCB$**  — is longitudinal distance of centre of underwater volume parallel to centreline of vessels, measured either from midship or from After Perpendicular ( Fig. 2 ).

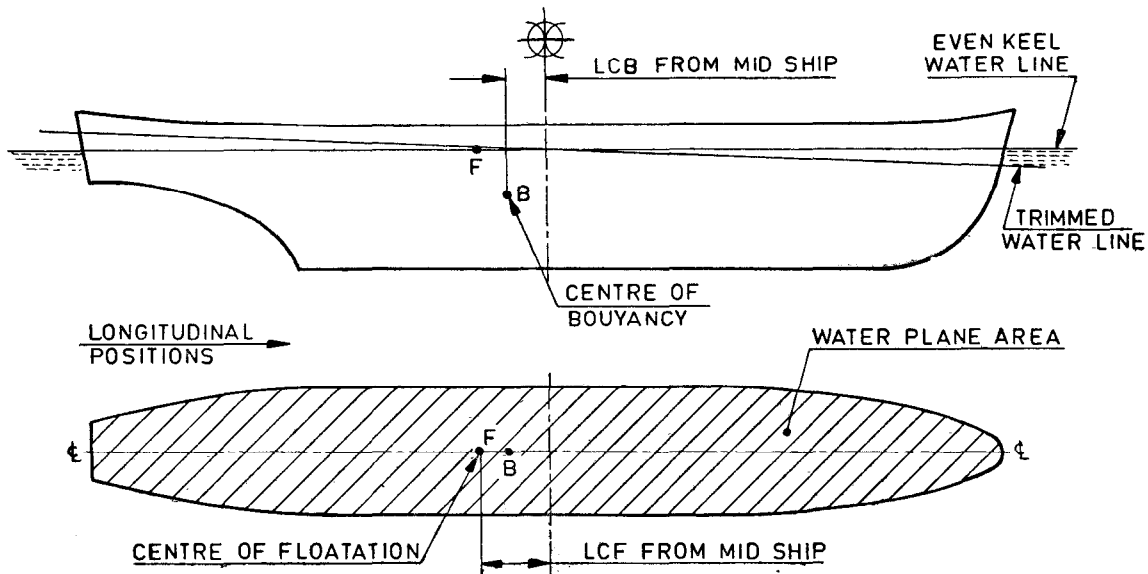


FIG. 2 NOMENCLATURE OF DECKED VESSEL ( LONGITUDINAL )

**3.6.6 LCF** — is longitudinal distance of centre of floatation of any particular waterplane area, measured parallel to centreline of vessel either from midship or from After Perpendicular ( Fig. 2 ).

**3.6.7  $TPC_m$**  — Tonnes per centimetre immersion of vessel, variable for different waterlines or for different draught.

**3.6.8 MCT** — Moment required in tonnes metres or kg-m required to change trim of the vessel for particular draught by 1 m or 1 cm.

**3.7 Inclining Experiments and Vertical Centre of Gravity** — Method of determining kg by inclining vessel more correctly than by calculation.

**3.8 Loading Conditions** — As applicable for different types of vessels in loaded fully or partly or in ballast condition.

**3.9 Metacentric Height (  $\overline{GM}$  )** — Vertical distance between metacentre and centre of gravity of the ship. For stability, it must be positive, that is, metacentre must be above the centre of gravity.

$$\overline{GM} = \overline{KB} + BM_i - \overline{KG}$$

#### 4. Requirements

**4.1 Heeling During Turning** — The maximum angle of heel of all selfpropelled vessels during turning at service speed with maximum loading shall not exceed 10°.

**4.1.1** The heel angle shall not exceed 6° while stationary or plying in fair weather conditions for Groups A, E and F; and in case of Group D vessels when there is maximum pull on the towing hook ( up to an angle of 60° off centreline of vessel ). In case of Group B vessels, heel angle shall not exceed 3° or an angle as specified by the manufacturer with maximum load on hook and at maximum designed outreach of boom of crane or garb.

**4.2 Metacentric Height** — The metacentric height (in metres ) shall be adequate for intended services; however, it shall, in any case, be not less than 0.15 m.

**4.3** The metacentric height shall be calculated for at least 3 different conditions of loadings as indicated in 5, 5.1, 5.1.1 and 5.2 for Groups A, B, C, D and G vessels. The hopper type vessels shall, in addition, be shown hopper spoils of 2 or 3 different specific gravities; similarly cargo carrying vessels with two more different cargo stowage rates.

**4.4 Freeboard (  $F$  )** — Minimum freeboard as per statutory requirements is to be maintained.

**4.5 Stability Data** — The particulars pertaining to stability are given in Table 1.

**4.6 Subdivision** — Vessels are to comply with statutory requirements of subdivision as applicable. However, there shall be minimum 3 watertight bulkheads for vessels up to 15 m length and 4 for vessels up to 25 m length. The longitudinal bulkhead for various types of vessels shall be as applicable.

#### 5. Loading Conditions

**5.1** The loading conditions shall be as follows:

- a) Light vessel with and without ballast,
- b) Light vessels with 90 percent stores and consumables,
- c) Light vessels with 100 percent full load and ballast as applicable, and
- d) Light vessels with 50 percent full load and ballast as required.

**5.1.1** In case of ballast being used, conditions without ballast shall be shown. Closed and open hopper conditions, as applicable, shall also be shown.

TABLE 1 PARTICULARS PERTAINING TO STABILITY

( Clause 4.5 )

SI No.	Particulars	Applicable To	Alternative for Exemption, if any
i)	General particulars	All groups	Nil
	a) Length over all		
	b) Length b. p		
	c) Breadth moulded		
	d) Depth		
	1) Depth moulded		
	2) Depth freeboard deck		
	e) Draught loaded mean and displacement		
	f) No. of decks and names		
	g) Double bottom tanks, height and total volume		
	h) Number of transverse bulkheads and cargo holds		
	j) Deadweight in holds and deck(s)		
	k) Total height of superstructure with average length		
	m) If self propelled — Speed (service)		
ii)	Capacity plan and tables	All groups*	Those exempted are to submit general arrangement drawings with sufficient details
iii)	Free surface moments table	All groups*	Those exempted are to submit general arrangement drawing with sufficient details and capacity diagram with tables
iv)	Hydrostatic curves or tables	All groups*	See Note 1 below
v)	Inclining experiment report	All groups*	Nil
vi)	Record on heelings according to 5.1, 5.1.1 and 5.2	Self-propelled vessels of all groups	Dump vessel to be exempted
vii)	Record on heeling according to 4.1.1	All groups	Complete calculation in absence of demonstration
viii)	Metacentric height calculations for loading conditions	All groups*	Additional loading conditions according to 3.8 and 5.1 do not apply to vessels below 15 m in length
ix)	Trim calculation	For vessels above 15 m in length having trim exceeding 15 percent of mean draught	Nil
x)	Cross curves of stability and GZ diagram with area under for all loading conditions	Vessels to ply or occasionally ply in partial smooth waters and in the harbours subject to serve weather conditions	Unless such vessels are already covered by appropriate Load Line Rules

**Note 1** — Vessels which need not satisfy (ix) and (x), can submit hydrostatic data covering only displacement  $KB$ ,  $BM_t$ ,  $KM_t$  and  $TP$  cm along with block co-efficient and waterplane co-efficient when submitted in tabular form, data are to be for draughts of every 0.05 metres for vessels up to 1.25 times loaded draught or up to depth, whichever is less.

**Note 2** — Items (viii), (ix) and (x) can be covered in one sheet for each loading condition.

\*Group E wooden vessels and, Group G(i) dry cargo vessels up to 15.0 m length and Group F vessels up to 10.0 m length may be exempted from submission of metacentric height ( $GMT$ ) calculations and allied technical data.

**5.2 Unequal Loading for Satisfying Heel Angle Limit** — Unequal loadings, other than the following may be determined by the respective statutory, authority and may be applicable to other types of vessels, if necessary. The centres between unequal weight or lever for moment distribution shall be reasonably correct depending upon load concentration, etc.

<i>Type of Vessel</i>	<i>Load Distribution</i>
Passenger ferries of Group A or E and F	Two-thirds number of total passenger and crew on one side extreme, one-third on other extreme, distributed on decks.
Deck loading vessels and vehicle ferries, etc.	When loaded with 50 percent of full load, 10 percent of full load or one large vehicle ( as applicable ) on one side extreme.
Tank vessels for liquid cargo	a) One large tank ( not greater than 10 percent of deadweight ) of any one side empty. b) Two tanks of any one side ( each tank volume not greater than 15 percent of DWT ) 50 percent full in both conditions, remaining tanks are full. ( Similarly for dry cargo with eccentric loading ).

## EXPLANATORY NOTE

An attempt has been made in this standard to lay down guidelines for stability for inland and harbour crafts. Some requirements such as heeling are somewhat common in some form or the other especially heeling during turning at service speed in most of the vessels. But Indian harbour vessels are so varied in type that it is difficult to stipulate minimum  $GM_t$ . However, an attempt has been made to put down the common requirements in a simplified form. These are mainly based on the limit ranges of  $KM_t$  and  $KG$  for different types of vessels having  $L/B$  up to 4.5 and  $B/T = 4$  to 5, when range of draught is from 0.75 to 1.8 m. Mostly, while designing, the lower limits are taken. However, precautions are required to be taken when the vessels become stiff. Thus, Upper limit of  $GM_t$  may be as high as  $B/4 - 0.25$  m.

At present, there are rules available which govern stability of such crafts though they vary from port to port depending upon local requirements; but a common set of rules can also satisfy almost all conditions. It is a fact that maximum casualty takes place because of insufficient stability in passenger vessel. Sufficient practical precautions for safety are required to be taken. An attempt has been made in this standard towards this direction.

Notwithstanding what is stated in the standard, the rules and requirements laid down by the statutory authorities, as applicable in all respect, shall apply.

This standard is being issued in the following two parts:

Part 1 Decked vessels

Part 2 Open vessels